**Questions for class discussion (14 January)**

Vectors in 2-space and 3-space



*Concentric spheres drawn with Mathematica*

1.   Find the *distance* between the two points (3, -1, 4) and (5, 5, -3).

2.   Find the *equation of a sphere* with center (1, 2, 3) and radius 4.

3.    Consider the sphere defined by the equation

(x – 2)2 + (y – 5)2 + (z – 8)2 = 8.

Find the *equation of the sphere* centered at (7, 17, 21) that is *tangent* to the given sphere.      *Hint:*  Begin with a picture.

4. Do the two spheres (x – 1)2 + (y – 2)2 + (z – 2)2 = 4 and

(x + 1)2 + (y + 2)2 + (z – 3)2 = 4 intersect? Why?

5. Let **v** = **i** + 2 **j**  and   **w** =  4 **i** + 3 **j**.   Compute **v** + **w** and display its geometrical meaning.

6.  Referring to problem (5), compute the *norm* of **v**, the *norm* of **w**, and the *norm* of **v**+**w**.

7.  Find a *unit vector* in the direction of **v** = **i** + 3 **j** + **k**.

8.  Express the vector from the point A = (2, 3, 4) to the point B = (7, 1, 0) as a vector in *standard position*.

9.  Explain the geometric meaning of *scalar multiplication* of a vector.

10.   Find all vectors in 2-space that have norm of 13 and **i**-component of 5.

11. Find the equation of the line *L* passing through (1, 0, 0) in the direction of **j**.

12. Find the equation of the line *L* passing through (3, -1, 2) in the direction of 2**i** – 3**j** + 4**k**.

13. Do the two lines L1(t) = (t, –6t + 1, 2t – 8) and L2(t) = (3t + 1, 2t, 0) intersect? Justify your answer!

15. Does the line L(t) = (2, –1, 2) + t(2, 3, 1) intersect the plane 5x – 3y – z = 6? If so, where?

16. *Normalize* the vector 5**i** – 3**j** – 4**k**

**Exercises from Stuart:**



*"...treat Nature by the sphere, the cylinder, and the cone..."*

                                                  - Paul Cézanne (1839-1906)

